SCIENCE

A WEEKLY JOURNAL DEVOTED TO THE ADVANCEMENT OF SCIENCE, PUBLISHING THE OFFICIAL NOTICES AND PROCEEDINGS OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

EDITORIAL COMMITTEE: S. NEWCOMB, Mathematics; R. S. WOODWARD, Mechanics; E. C. PICKERING Astronomy; T. C. MENDENHALL, Physics; IRA REMSEN, Chemistry; CHARLES D. WALCOTT, Geology; W. M. DAVIS, Physiography; HENRY F. OSBORN, Paleontology; W. K. BROOKS, C. HART MERRIAM, Zoology; S. H. SCUDDER, Entomology; C. E. BESSEY, N. L. BRITTON, Botany; C. S. MINOT, Embryology, Histology; H. P. BOWDITCH, Physiology; WILLIAM H. WELCH, Pathology; J. MCKEEN CATTELL, Psychology.

FRIDAY, DECEMBER 4, 1903.

CONTENTS:

The American Association for the Advancement of Science 705

The Typical College Courses dealing with the Professional and Theoretical Phases of Electrical Engineering: PROFESSOR DUGALD C. JACKSON 710

The British Association for the Advancement of Science—Section of Anthropology: DR. GEORGE GRANT MACCURDY 716

Societies and Academies:—

Biological Society of Washington: F. A. LUCAS. *The Philosophical Society of Washington:* CHARLES K. WEAD. *The New York Academy of Sciences, Section of Anthropology and Psychology:* PROFESSOR J. E. LOUGH. *Section of Astronomy, Physics and Chemistry:* DR. S. A. MITCHELL. *Clemson College Science Club:* F. S. SHIVER 722

Discussion and Correspondence:—

Visual Phenomenon: DR. PERSIFOR FRAZER. 729

Shorter Articles:—

A Fruiting Stage of Rhizoctonia Solani: F. M. ROLFS. *Results of the Resurvey of Long Island:* M. L. FULLER, A. C. VEATCH. 729

Current Notes on Meteorology:—

Blood Counts at High Altitudes; West India Hurricanes; Cloud Observations at Simla: PROFESSOR R. DEC. WARD 731

Sanitation and the Panama Canal 732

Resolutions of the Faculty of Cornell University on the Death of Professor Robert H. Thurston 732

Scientific Notes and News 733

University and Educational News 736

MSS. intended for publication and books, etc., intended for review should be sent to the responsible editor, Professor J. McKeen Cattell, Garrison-on-Hudson, N. Y.

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

THE fifty-third annual meeting of the American Association for the Advancement of Science, and the second of the convocation week meetings, will be held in St. Louis, Mo., on December 28, 1903, to January 2, 1904.

A meeting of the executive committee of the council (consisting of the general secretary, the secretary of the council, the permanent secretary, and the secretaries of all of the sections), will be held at the office of the permanent secretary, in the Southern Hotel, Broadway and Walnut Sts., at noon on Saturday, December 26.

The opening session of the association will be held at 10 o'clock A.M., on Monday, December 28, in the auditorium of the Central High School building.

A railway rate for one and one third on the certificate plan has been granted by several railways, and it is expected that this rate will be granted by all the railways of the country.

The headquarters of the association will be at the Southern Hotel, and the Planters Hotel will be selected as headquarters for some of the affiliated societies.

For further matters relating to the local arrangements, transportation and hotel and boarding-house accommodations, address the local secretary, Professor A. S.

Langsdorf, Washington University, St. Louis, Mo.

For information relating to the presentation of papers, members should address the secretaries of the respective sections. Titles and abstracts of papers should be sent promptly to the secretaries, or to the permanent secretary. Blank forms upon which abstracts may be filled out will be forwarded. The post-office addresses of the several secretaries are given in the list of officers following this general announcement.

Nominations to membership and letters relating to the general business of the association should be sent to the permanent secretary at the address given herewith. It is strongly urged that each member reading this announcement should at least make an effort to secure the nomination of some desirable new member.

Members paying their dues before December 20 will receive their tickets by mail at once, and will thus save time in registering on their arrival at St. Louis, provided they bring their tickets with them.

The register for the St. Louis meeting will be open at 10 A.M., on Saturday, December 26, at the general office of the local and permanent secretaries in the Central High School Building.

L. O. Howard,
Permanent Secretary, Cosmos Club,
Washington, D. C.

Officers for the meeting are as follows:

President: Carroll D. Wright, Commissioner of Labor, Washington, D. C.

Vice-Presidents: (A) *Mathematics and Astronomy*—Otto H. Tittmann, Coast and Geodetic Survey, Washington, D. C. (B) *Physics*—E. H. Hall, Harvard University, Cambridge, Mass. (C) *Chemistry*—W. D. Bancroft, Cornell University, Ithaca, N. Y. (D) *Mechanical Science and Engineering*—C. M. Woodward, Washington University, St. Louis, Mo. (E) *Geology and Geography*—I. C. Russell, University of Michigan, Ann Arbor, Mich. (F) *Zoology*—Edward L. Mark, Harvard University, Cambridge, Mass. (G) *Botany*—T. H. MacBride, University of Iowa, Iowa City, Iowa. (H) *Anthropology*—M. H. Saville, American Museum of Natural History, New York, N. Y. (I) *Social and Economic Science*—Simeon E. Baldwin, New Haven, Conn. (K) *Physiology and Experimental Medicine*—H. P. Bowditch, Harvard University, Cambridge, Mass.

Permanent Secretary: L. O. Howard, Cosmos Club, Washington, D. C.

General Secretary: Ch. Wardell Stiles, Public Health and Marine Hospital Service, Washington, D. C.

Secretary of the Council: Charles S. Howe, Case School, Cleveland, Ohio.

Secretaries of the Sections: (A) *Mathematics and Astronomy*—L. G. Weld, University of Iowa, Iowa City, Iowa. (B) *Physics*—Dayton C. Miller, Case School, Cleveland, Ohio. (C) *Chemistry*—C. L. Parsons, New Hampshire College, Durham, N. H. (D) *Mechanical Science and Engineering*—Wm. T. Magruder, Ohio State University, Columbus, Ohio. (E) *Geology and Geography*—G. B. Shattuck, Johns Hopkins University, Baltimore, Md. (F) *Zoology*—C. Judson Herrick, Denison University, Granville, Ohio. (G) *Botany*—F. E. Lloyd, Teachers' College, Columbia University, New York, N. Y. (H) *Anthropology*—Geo. H. Pepper, American Museum of Natural History, New York, N. Y. (I) *Social and Economic Science*—J. F. Crowell, Bureau of Statistics, Washington, D. C. (K) *Physiology and Experimental Medicine*—Frederic S. Lee, Columbia University, New York, N. Y.

Treasurer: R. S. Woodward, Columbia University, New York, N. Y.

The local committee includes:

Honorary President: David R. Francis.

President: William Trelease.

Vice-Presidents: First Vice-President, C. M. Woodward. Second Vice-President, F. Louis Soldan. Third Vice-President, R. H. Jesse.

Treasurer: William H. Thomson.

Secretary: Alexander S. Langsdorf.

Executive Committee: William Trelease, Chairman; Geo. H. Morgan, Secretary; William H. Thomson, Treasurer; W. S. Chaplin, A. S. Langsdorf, F. E. Nipher, John Schroers, Walter B. Stevens, William Taussig, H. C. Townsend.

PRELIMINARY PROGRAM.

At the first general session, to be held at 10 A.M., the meeting will be called to order

by the retiring president, Dr. Ira Remsen, who will introduce the president-elect, the Hon. Carroll D. Wright, and short addresses of welcome and announcements will be made. The retiring president will give his address at the Odeon in the evening, and in the afternoon the addresses of the retiring vice-presidents will be given, as follows:

At 2:30 P.M.

Vice-president Halsted before the Section of Mathematics and Astronomy.

Vice-president Baskerville before the Section of Chemistry.

Vice-president Davis before the Section of Geology.

Vice-president Dorsey before the Section of Anthropology.

At 4 P.M.

Vice-president Nichols before the Section of Physics.

Vice-president Waldo before the Section of Mechanical Science and Engineering.

Vice-president Hargitt before the Section of Zoology.

Vice-president Coville before the Section of Botany.

Vice-president Newcomb before the Section of Social and Economic Science.

The sections will meet daily immediately after the adjournment of the general session, and from that time until one o'clock, and then after an intermission of one hour for luncheon, from two to five, except on Thursday afternoon which will be devoted to a visit to the exposition grounds. For details the daily programs, to be had of the local secretary and in the section rooms, should be consulted.

Though other evening sessions may be announced later, the local committee now has knowledge of only the following evening events:

Monday Evening.—The retiring president of the association, President Ira Remsen, of the Johns Hopkins University, will deliver his address in the Odeon, at the corner of Grand and Finney Avenues, at eight o'clock. The subject, which will be of general interest, will be announced later. The public are invited to attend.

Tuesday Evening.—Sections D and F are likely to hold evening sessions.

The American Association and the American Society of Naturalists hope to secure a lecture, complimentary to the citizens of St. Louis, on a subject of general interest and by a speaker of international reputation, in the auditorium of the Central High School, at eight o'clock; if so due announcement will be made.

At nine o'clock the American Society of Naturalists and affiliated societies will hold their annual smoker at the University Club, Grand and Washington Avenues.

Wednesday Evening.—Section D is likely to hold an evening session.

The retiring president of the American Chemical Society, Dr. John H. Long, will deliver his address in Room 102, at 7:30 o'clock. His subject is 'Some Problems in Fermentation.'

The annual election of the American Society of Naturalists will be held at the Mercantile Club, Seventh and Locust Streets, at 6:45. At seven o'clock, in the same place, will be given the annual dinner of the society, followed by the address of the retiring president, Professor William Trelease. Members of this society and of the societies affiliating with it are requested to register for the dinner as soon as possible after reaching the city, at the desk of the local secretary, who will receive payment for and issue tickets—to be taken up at the dinner.

Thursday Evening.—The regular meeting of the general committee of the association, consisting of the council and one member from each section, will be held at the hotel office of the permanent secretary, at the Southern Hotel, at eight o'clock, to elect officers and decide upon the time and place of the next meeting.

The annual banquet of the Sigma Xi

Honorary Scientific Society will be given at the Mercantile Club, Seventh and Locust Streets, at seven o'clock. The banquet will be followed by an address by President David Starr Jordan, of the Leland Stanford Junior University. Members are requested to register and procure tickets for the banquet, at the desk of the local secretary, as soon as possible after arriving in St. Louis.

Friday Evening.—The fourteenth banquet to the Trustees of the Missouri Botanical Garden and their guests, provided for in the will of the founder of the garden, will be given at an hour and place to be announced later.

ENTERTAINMENTS.

In providing entertainment for their scientific guests, the local committee has tried to avoid interference with the regular sessions of the association and affiliated societies, and the season of the year at which the meeting is held and the need of a prompt return to their university duties felt by most of their guests have prevented the committee from planning for excursions such as they would have found pleasure in providing under other circumstances. They take pleasure, however, in announcing the following features, which will be more fully detailed in the daily programs.

By invitation of the officers of the Louisiana Purchase Exposition, members of the association and affiliated societies will, on one of the days of their meeting, proceed in specially provided cars to the World's Fair grounds, immediately after the noon adjournment. On the grounds, they will be tendered a buffet luncheon by the officers of the exposition, after which, in parties of suitable size, they will be taken through the buildings and shown the progress of installation of the exhibits under the personal charge of the chiefs of departments, under whom the installation is being made.

The chemists are invited to visit the great breweries, either in a body or as individuals, and promised every courtesy in inspecting these and other features of interest to them.

The geologists will receive every possible courtesy from the managers of the smelting and similar establishments of the city which they may find it possible to visit, and it is probable that those who care to do so will have the privilege of visiting the great lead mines of southeastern Missouri, if they can spare a day for this purpose.

The engineers will be enabled to visit the historical Eads Bridge over the Mississippi River, the pumping plant and settling basins furnishing the city water supply, and other points of interest to them, as well as the engineering features of the exposition, of which a special study will be made.

The botanists are invited to visit the Missouri Botanical Garden, either in a body or individually, and are promised every aid that can make their visit pleasurable or profitable.

In addition to the address by the president of the American Association, to be given in the Odeon on Monday evening, it is expected that one other public lecture, complimentary to the citizens of St. Louis will be delivered on another evening by a speaker of international reputation on a subject of both scientific and general interest.

The entertainment committee proposes to furnish luncheon in the high school building, so that members may meet together and without being under the necessity of leaving the building for this purpose. It is expected that courtesies will be extended by a local ladies' club to ladies in attendance at the meetings, and the city clubs, the trustees of the Missouri Botanical Garden, the Academy of Science, and other

local organizations will do what is in their power to make the week a pleasant one to those who attend the meetings.

AFFILIATED SOCIETIES.

The following societies have indicated their intention to meet in St. Louis, in convocation week, in affiliation with the American Association for the Advancement of Science or with the American Society of Naturalists. For further details, the daily programs should be consulted.

The American Anthropological Association will meet in affiliation with Section H. President, W J McGee; Secretary, George A. Dorsey, Field Columbian Museum, Chicago, Ill.

The American Chemical Society will meet on Monday and Tuesday. Hotel headquarters will be at the Southern. Meetings will be held in affiliation with Section C. The address of the retiring president, Dr. John H. Long, on 'Some Problems in Fermentation,' will be given in Room 102 of the high school, on Wednesday evening, at 7:30. President, John H. Long; Secretary, Wm. A. Noyes, Johns Hopkins University, Baltimore, Md.

The American Mathematical Society—Chicago Section will meet on Thursday and Friday in affiliation with Section A of the Association. Titles and abstracts of papers should be in the hands of the secretary not later than Saturday, December 12. Secretary, Thomas F. Holgate, Northwestern University, Evanston, Ill.

The American Microscopical Society will meet, probably on Tuesday. A stereopticon will be provided for the use of members. President, T. J. Burrill; Secretary, H. B. Ward, Lincoln, Nebraska.

The American Physical Society will meet in affiliation with Section B. President, Arthur G. Webster; Secretary, Ernest Merritt, Cornell University, Ithaca, New York.

The American Psychological Association will meet on Tuesday and Wednesday. President, W. L. Bryan; Secretary, Livingston Farrand, Columbia University, New York, N. Y.

The American Society of Naturalists will meet on Tuesday and Wednesday. The public discussion, on 'What Academic Degrees should be conferred for Scientific Work,' will be held on Wednesday afternoon, and the annual dinner will be given at the Mercantile Club, on Seventh and Locust Streets, Wednesday evening. Members of this and affiliated societies are requested to register and procure tickets for the dinner at the local secretary's office as early as possible in the week. President, William Trelease; Secretary, Ross G. Harrison, Johns Hopkins Medical School, Baltimore, Maryland.

The American Society of Zoologists—Central Branch will meet in affiliation with Section F. President, J. E. Reighard; Secretary, Frank Smith, University of Illinois, Urbana, Ill.

The Association of Economic Entomologists will meet on Tuesday and Wednesday. President, M. V. Slingerland; Secretary, A. F. Burgess, Columbus, Ohio.

The Association of Plant and Animal Breeders will hold its first meeting on Tuesday, Wednesday and Thursday. Chairman, W. M. Hays, St. Anthony Park, Minn.

The Astronomical and Astrophysical Society of America will meet in affiliation with Section A. President, Simon Newcomb; Secretary, George C. Comstock, University of Wisconsin, Madison, Wis.

The Botanical Club of the Association will probably meet as convenient times.

The Botanical Society of America will meet on Tuesday, Wednesday and Thursday. The address of the retiring president, Dr. B. T. Galloway, will be on 'What the Twentieth Century demands of Botany.' President, Charles Reid Barnes;

Secretary, Daniel T. MacDougal, Botanical Garden, Bronx Park, N. Y.

The Central Botanists' Association will meet in affiliation with Section G. President, Conway MacMillan; Secretary, C. F. Millspaugh, Field Columbian Museum, Chicago, Ill.

The Entomological Club of the Association will meet at convenient times. President, E. A. Schwarz; Secretary, C. L. Marlatt, Department of Agriculture, Washington, D. C.

The Fern Chapter will meet at times to be announced. President, B. D. Gilbert; Secretary, H. D. House, Botanical Garden, Bronx Park, New York, N. Y.

The Geological Society of America will meet on Wednesday at its hotel headquarters, at the Southern. Subsequent sessions may be held in room 210 of the high school. President, S. F. Emmons; Secretary, H. L. Fairchild, Rochester, N. Y.

The Sigma Xi Honorary Scientific Society will meet at a time to be announced later. The annual banquet, to be followed by an address by Dr. David Starr Jordan, will be given at the Mercantile Club, Seventh and Locust Streets, on Thursday evening at seven o'clock. Members are requested to register and procure tickets for the banquet, at the desk of the local secretary, as early as possible in the week. President, S. W. Williston; Secretary, E. S. Crawley, University of Pennsylvania, Philadelphia, Pa.

The Society for Horticultural Science will hold its first regular meeting on Monday and Tuesday. President, L. H. Bailey; Secretary, S. A. Beach, Experiment Station, Geneva, N. Y.

The Society for the Promotion of Agricultural Science will hold its quarti-centennial meeting on Monday. President, William Frear; Secretary, F. M. Webster, Urbana, Ill.

All members of affiliated societies who are not members of the American Association for the Advancement of Science are nevertheless requested to register at the desk of the local secretary, so that an approximate record may be made of the total number of scientific men in attendance at the convocation week meetings. Members of the American Society of Naturalists and its affiliated societies, and of the Sigma Xi Honorary Scientific Society are also requested to procure tickets for the annual dinners of these societies from the local secretary as soon as possible after arrival, so that arrangements for the dinners may be perfected.

---

*THE TYPICAL COLLEGE COURSES DEALING WITH THE PROFESSIONAL AND THEORETICAL PHASES OF ELECTRICAL ENGINEERING.**

At the Chicago meeting of the American Institute of Electrical Engineers held eleven years ago, I presented a paper relating to the subject now under discussion. The proposed subject then apparently created some consternation amongst the members of the committee on papers, who seemed to fear that it was not of sufficient interest to the society. The old prejudice still held against 'college men' in the minds of so-called 'practical men' who had grown influential in engineering practice without having had experience of college life and training. Happily the foundation for this prejudice has ere this been destroyed through the influence of the industrial results achieved by college men. The old prejudice, so far as it now exists, has more particularly drifted into the way of criticism of the engineering schools rather than their graduates, and the character of the schools and the training they afford are

* Paper read at the joint session of the American Institute of Electrical Engineers and the Society for the Promotion of Engineering Education, held at Niagara Falls on July 3, 1903.

subjects of eager discussion in engineering circles.

This extended interest now manifested in the work of the engineering schools produces a situation which may be of great usefulness to the schools. The character of a college may be that which its alumni determine, and any engineering school may be improved by thoughtful suggestions and broadly considered criticisms emanating from its alumni and others who have its best interests at heart.

Two fundamental propositions must be held clearly in view in all such criticisms, if they are to be of service to the educational administration of the engineering colleges:

1. That it is the business of these colleges to train young men into fertile and exact thinkers guided by common sense, who have a profound knowledge of natural laws and the means for utilizing natural forces for the advantage of man. In other words, it is the business of the engineering colleges to produce, not finished engineers, but young men with *a great capacity for becoming engineers*, the goal being obtained by the graduate only after years of development in the school of life.

2. The problem to be met by the engineering colleges is more particularly a problem in *how to properly train* to the stated purpose. The names attached to the subjects taught are not so important as the results produced by the teaching—namely, the effect impressed on the students' powers. This is a teacher's problem—a question of pedagogy, rather than of the engineering profession. It must be met with all the directness and power of the engineer's best efforts, but it can not be solved as solely relating to the engineering profession. Much error on this point lies in the minds of many who assume the part of critics of the curricula of the engineering schools.

In this connection I may be permitted to point out that proposals set up as apparently new in the presidential address one year ago, by President Steinmetz of the American Institute of Electrical Engineers, have for many years been largely included within the ideals of numerous American colleges of engineering. It must be admitted that only a few of the engineering schools are living up to their better ideals. This is partially due, on the one hand, to personal or institutional ambitions which foster the sensational or spectacular and thereby inevitably ruin good teaching, and, on the other hand, to the meager support in both encouragement and funds which I have noticed is the lot of the engineering schools attached to many universities. The latter like the former is often the result of personal prejudices or ambitions.

Most of the faults which are so trenchantly and indiscriminately charged to engineering colleges by many engineers should, so far as they are real, be laid to the pedagogical inexperience and faulty ambitions of the authorities of the many colleges; and exception should be made of the few of the first rank, in which, it is safe to say, the ideals are high and well centered and the administrative organizations hold the ideals continuously in view.

The query here naturally arises: Of what do these ideals properly consist and how fairly should they be met by the college before its course in electrical engineering may be approved as of first rank?

Electrical engineering demands industrial engineers—men with an industrial training of the highest type, competent to conceive, organize and direct extended industrial enterprises of broadly varied character. For the highest success, these men must be keen, straightforward thinkers who see things as they are, and are not to be misled by fancies; they must have an extended, and even profound, knowledge of

natural laws (more particularly of those relating to energy which rest on the law of conservation of energy), an extended knowledge of the useful applications of these laws, and an instinctive capacity for reasoning straight, from cause to effect. Moreover, they must know men and the affairs of men—which is sociology; and they must be acquainted with business methods and the affairs of the business world. Briefly, to reach his highest influence, each man must combine in one a man in the physical sciences, a man in sociology and a man of business. All engineers can not reach this high mark, but the engineering college course should start each of its students toward that degree of attainment which his individual powers will permit.

Michael Faraday (whose conservatism and intellectual clearness are proverbial) said that it requires twenty years to 'make a man' in the physical sciences. The engineering school must put each student in the way of becoming, so far as his mental and physical powers warrant, not only a man in the physical sciences, but a man in sociology and a man in business as well; and this must be done within the narrow limits of four years. It is clear that only the foundations of 'the man' may be laid in the prescribed time, and the engineering college must, therefore, rigorously hold itself to the fundamentals. The engineering college faculty which is contented to deal out so-called 'information courses' on the narrowly empirical side of engineering practice, deals a wrong to its students which they may not recognize at the moment, but which will ultimately tell heavily against their success.

The students that enter the engineering schools of the west, and I presume likewise of the east, are from amongst the most vigorous minds of the high schools and preparatory schools; and yet it must be admitted that they ordinarily possess little power of clear thinking, power of initiative, regard for accuracy, or understanding of continuous and severe intellectual effort, as these important attributes are understood in industrial circles. They are not yet mature in body and are less mature in mind (the latter being, I think, in accord with the natural order of development). But they commonly are well equipped with physical vigor and latent mental strength. Their preparatory schooling has given them a defective acquaintance with the construction of the English language and the spelling of English words, a still more defective acquaintance with French or German or a fairly good grounding in elementary Latin, a smattering of civics and history, a training in the elementary principles of arithmetic, geometry and algebra from which the factor of accuracy in application has often been omitted, and perhaps an enthusiastic interest in the physical sciences.

This enumeration of the attainments of the students entering the engineering colleges may perhaps be interpreted as reflecting on the secondary school teachers, but I wish vigorously to deny the validity of any such interpretation. I can truthfully say that, considering all of the conditions, there is no more painstaking and right-wishing body of people than these teachers.

Many of the faults in the preparatory training of our engineering college students are caused by a doubt which is now apparently agitating educational circles on account of the question whether the high schools shall be the 'people's colleges' or remain in the station of secondary or 'preparatory' schools. This doubt is apparently not yet resolved in the minds of the molders of educational thought; but the traditional old-time secondary school training which produced men who could spell and cipher and who had received a

thorough and accurate drill in the details of one language, is certainly to be preferred as a preparation for an engineering college course. In my own estimation, when accompanied with history and a year spent in civics and natural science, it is not only to be preferred as a school course for preparing the student for college, but also a course for those numerous students who can not go through college.

Taking the students as they come and may be expected to come for the present, the electrical engineering course must include the following branches of learning which are preparatory to the more strictly professional studies:

1. That fuller training in the construction of the English language which is requisite to clear thinking and clear writing, preferably accompanied by an additional language for added strength.

2. The collateral art of expression in drawing.

3. Mathematics through an appropriate amount of calculus, including the integration and solution of equations involving derivatives and instruction in the use of coplanar vectors, and perhaps quaternion quantities, all of which should be taught as applied logic, with special emphasis laid on interpreting the meaning of equations.

4. The science of chemistry, soundly taught.

5. The science of physics, soundly taught, with particular emphasis laid on the elementary mechanics.

6. Applied mechanics.

Mechanics—the philosophy of matter, force and energy—is the backbone of the electrical engineer's college training.

Instruction in the science branches should be accompanied by well-conceived and properly conducted laboratory work, mostly of quantitative character, accompanying and illustrating the class-room instruction; and all instruction whether in natural science, mathematics or languages, should be under the direction of men who are engineers or in full sympathy with the aims and ideals of engineering.

A limited amount of manual training may well accompany these studies, and likewise, if time can be found for it without over-burdening the reasonable physical powers of the student, a limited amount of proper instruction in surveying (including the use of the compass, transit and level) will always prove a force for quickening the student's perceptions and at the same time put him into possession of processes of probable future value.

In a few of our engineering colleges which rigidly demand the best preparatory work from the high schools, and which are, at the same time, best manned in their faculties, not less than two years are required to cover the ground above described, if the work is done in a reasonably satisfactory manner. But the above ground can not be covered with anything like reasonable success in much or any less than three years in the larger number of engineering schools that are usually accorded high rank. After covering these branches, it seems to be the tendency in many colleges to fly off into superficial or descriptive courses, relating to engineering practice, during the remaining time of the allotted four years. This is especially apparent in those colleges where the faculties are ambitious to see their graduates take an *immediate* place of considerable responsibility in the world. This is a fault that destroys much of the ultimate advantage which the students may derive from their engineering course. It is a fault, also, which casts just suspicion on engineering education alike in conservative academic circles and in well-informed industrial circles.

A resort to mainly descriptive courses of instruction during the latter portion of the

students' life in college largely neutralizes the advantage flowing from the instruction in the fundamentals heretofore described. The students are yet to be taught many things relating to engineering life. They must learn something regarding the forms and formalities relating to the affairs of business life. They must learn the characteristics and uses of materials, their correct application to the building of actual structures, the meaning of kinematics and the processes of designing and using real machinery. They must also learn to reason regarding the special principles of hydraulics and thermodynamics, and the way in which they enter into the design, construction and operation of machines, and the manner in which they modify the usefulness of machines and the efficiencies of numerous industrial operations. Again, they must learn to reason clearly and rationally in regard to the specific principles relating to applied electricity, including its widely diverse factors, and the way in which these principles enter into every-day practise. And they should learn something of the history of the development of engineering and of the lives of its great men, for the stirring of proper ambitions.

The electrical engineering department should be divided into not less than four subdivisions, comprising respectively: Applied electromagnetism, which includes the principles relating to electromagnetic machinery and apparatus; the theory and practice of alternating and variable currents, which include the principles relating to all those numerous phenomena which accompany variable current flow; applied electrochemistry and electrometallurgy; and electrical installations, which includes the applications in engineering practice of the numerous principles to the design, construction, operation and testing of complete installations and the component parts thereof.

The teaching force of the department should afford a competent expert engineer for the head of each of these subdivisions, and such additional well-trained force as may be necessary to adequately carry on class-room and laboratory instruction for the particular numbers of undergraduate and advanced students which attend the college. The head of such a department should spend much of his time in supervising the teaching in class-room and laboratory which is performed by his various subordinates.

But through all of this professional instruction of the latter part of the course, it is still *principles, principles, principles,* and rational methods of reasoning which must be taught, if full justice is done the students, until each student becomes a man of open mind, keen observation, analytical thinking and accurate powers of inference. This instruction should be kept close to the tenets of good practise, and the senses of the student should be constantly stimulated by illustrations and problems drawn from practice. The drill in reasoning can undoubtedly be best gained through rational instruction in the useful applications of scientific principles and laws; and no criticism can be justly passed even by the most conservative educational circles because the graduate is enabled to earn his living as a result of this training; but the purely descriptive should ordinarily be avoided except in a few cases where it has a specific function in improving the understanding of an application of principles or is adopted as a desirable auxiliary to stimulate the sustained interest of the students and thus add vitality to the teaching. Indeed, except for the purposes here defined, the introduction of the purely descriptive into the electrical engineering course wastes the students' time and injures their training, thus abridging their prospects of ultimate breadth and power.

The typical courses in electrical engineering which are to-day advertised in college catalogues belong to three classes or combinations thereof. Only the third of these may be acknowledged to fairly meet the proper ideals in such a course. It is to be remembered that I speak of professional engineering. No one possesses a fuller sympathy with the ideals of schools for training men for the mechanical trades short of engineering and bordering thereon, but these schools are not considered in my present discussion.

First, are courses in which predominate the old time instruction in physics with far more to do with the illustration of the beauties of nature than with the great underlying natural laws. The teaching of mathematics, mechanics and like groundwork studies is not ordinarily well supervised in colleges that maintain such courses in electrical engineering, because the administrative authorities are out of touch with the industrial world and mistakenly put the superficial and spectacular in science into the place of that sound instruction only through which an engineering course may be rightly maintained. It is needless to add that the average graduate from courses of this type is ordinarily of less value in engineering than the average graduate from an old-time classical course where at least thoroughness is a requirement; and electrical engineering courses of this type are rapidly disappearing through a merging into one of the following types.

Second, are courses in which the groundwork studies (English, mathematics, chemistry, physics, mechanics) are perhaps reasonably well taught through the earlier years, but in which the latter part of the course is diverted to the training of inexperienced students for immediate 'jobs' where the students may find some responsibility and proportionate pay immediately after graduation. These courses do not teach engineering in the sound sense. They are likely to injure the future of promising students by occupying time in teaching them handicrafts in college which they could better learn in the factory or field, or in teaching empirical methods of practise which change almost before they can be put to useful account by the graduates.

The students in these courses frequently gain the impression that the highest type of engineering practice is no more than an advanced artisanship, and that a graduate from the electrical engineering course is the equivalent of a journeyman. The most serious injury flows from this, through the undesirable narrowing of ideals and ambitions. This unfortunate result occurs the more readily because the popular usage of the word engineer makes it denote either an engine driver (a man of purely manual calling) or a man skilled in the principles and professional practice of engineering.

Third, are courses following the ideals which I have herein earlier described. Incompetent students who enter these courses are soon discouraged and drop out. Those whose calling is to artisanship go elsewhere either to a different school or directly to an apprenticeship. Those who complete the course, as a rule, are competent men; but they are not likely to enter immediately into positions of much responsibility, but rather to go into the so-called 'cadet' positions or 'student' positions of great industrial enterprises, for the purpose of gaining that experience in the crafts which may enable them to make the most extended use of their training in principles. Here they gradually 'find themselves' and ultimately reach the influence in the industrial world for which their caliber and training fit them. These men, if properly taught, have clean-cut ambitions and high ideals as well as the

ability to think well and do wisely. Their earnings and perhaps their usefulness to their employers, may be not so great for a short interval as those of the men who are taught more of empiricism and artisanship and less of rational science during their college courses, but the advantage soon flows in a strong current towards the scientifically trained.

The men who are responsible for this third type of electrical engineering courses may reasonably cry to be delivered from judgment upon the success of their work, which is based on the average earnings of the graduates during their first year out of college. The medical schools and law schools are judged by the attainments of their graduates reached in a decade or even in a quarter of a century, and this also should be the basis upon which to judge the work of the electrical engineering courses of this third and highest type.

Do not believe for a moment, however, that I would teach all theory and no practise. The earlier parts of this paper prove the contrary. In truth, right theory and the best practise are one, and practise which is out of accord with right theory is mere rule of thumb and can be bettered. The best college course in electrical engineering is the one which so teaches the fundamentals that right theory may be fully grasped, and which constantly illustrates the bearing of theory by examples derived from good practise. The administration of such a course requires thoughtful, clear-headed men, who are acquainted with the principles and right practise of pedagogy as well as trained in the principles and experienced in the practise of engineering.

My discussion of the subject makes it clear that there is a wide variance between the methods of the colleges which support electrical engineering courses. Complete unity is not only impossible but would undoubtedly be undesirable, since scope for individuality is as essential here as in the control of industrial enterprises; but the cause of sound college training for electrical engineers would be advanced by any action which clearly places the true aims of the college courses in electrical engineering before the authorities of all of our colleges which support such courses. And I may add that many of the greatest weaknesses of electrical engineering courses are due to the fact that the executive heads of the colleges or universities do not always understand what engineering truly stands for, and they equally often have no fair conception of the soundness of training that is required for its practise.

Dugald C. Jackson.
University of Wisconsin.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE—SECTION OF ANTHROPOLOGY.

The seventy-third annual meeting of the British Association was held in Southport, Lancashire, September 9–16. As will be seen by the dates, the meeting lasts a whole week, from Wednesday to Wednesday. Professor Johnson Symington, of Queen's College, Belfast, presided over the anthropological section. His address, published in a recent issue of this journal, was a plea for a more thorough and systematic collecting of human brains for purposes of detailed and comparative study; also a more thorough study of the cranial cavity in relation to the outer surface of the skull, on the one hand, and, on the other, its relation to the brain itself. It is known that definite areas of the cerebral cortex are connected with the action of certain groups of muscles; and that the nervous impulses, starting from the organs of sight, hearing, smell and touch, reach defined cortical fields. But all these do not cover

more than a third of the convoluted surface of the brain. The problem before anthropologists is to explore the remaining two thirds of the brain surface, which is still practically a *terra incognita*.

A number of papers on somatology followed Professor Symington's address. A collection of some eighty skulls from Round Barrows in East Yorkshire was the subject chosen by Mr. William Wright, of the University of Birmingham. The interments closely resemble each other, and belong to the late Neolithic and early Bronze Age. A great variety of cranial shapes are met with, the cephalic index ranging from 69 to 92. Metopism, when found, occurred in long skulls rather than broad skulls. There seemed to be no correlation between skull-shape and the mandibular and coronoid indices. Dr. Thurnam's dictum 'round barrow, round skull' is not even approximately accurate for the round barrows of Yorkshire.

Mr. Annandale's paper on a 'Collection of Skulls from the Malay Peninsula' dealt with material which he himself had helped to collect. The crania in question came from the Patani states, the population of which is very mixed, consisting partly of so-called Malays and partly of so-called Siamese, the difference between the two peoples being chiefly one of religion. The series has a higher cephalic index and a greater cubic capacity than would be found among the jungle tribes of the Malay Peninsula. Another distinguishing feature is the tendency of the third molar to disappear.

Mr. E. J. Evatt, in his paper entitled 'Some Observations on the Pads and Papillary Ridges on the Palm of the Hand,' pointed out that during the course of development of the hand eleven well-defined pads or cushions appear on the palm. The disposition and form of the pads when best marked in the fœtus correspond very closely with that which obtains in certain animals, *e. g.*, the mouse; the cushions in both cases are probably morphologically equivalent, and in man's remote ancestors possibly served similar functions. The pads in the adult may be regarded as vestigial. The papillary ridges were differentiated when the hand began to be used as an organ of prehension rather than locomotion, and the patterns assumed their present form as the result of mechanical forces.

Mr. David MacRitchie in 'Mongoloid Europeans,' supports Beddoe's view to the effect that 'some reason can be shown for suspecting the existence of traces of some Mongoloid race in the modern population of Wales and the West of England.' This strain may have come direct from the cave man or from a fresh Mongoloid immigration at a much later date, *e. g.*, the Hun conquests of the fifth century.

The committee appointed by the British Association to organize anthropometric investigation in Great Britain and Ireland submitted an important report, and asked to be reappointed with instructions to carry out the recommendations of its chairman, Professor J. Cleland, and to draft a scheme for a central anthropometric laboratory. Such a laboratory would 'collect and disseminate information on anthropometric work, give practical instruction in measurements, and supply schedules.'

By this means, uniform standards in anthropometric investigations would be secured, measurements best suited for any specific problem could be recommended, and cooperation among investigators assured. It is suggested that the central laboratory be attached to some already existing institution, preferably the Anthropological Institute.

The committee on 'Anthropometric Investigations Among the Native Troops of the Egyptian Army' (Professor A. Mac-

alister, chairman) announced that since their last report, Dr. C. S. Myers has published a paper in the current number of the *Journal of the Anthropological Institute* on 'Tattooing in Modern Egypt,' the material for which was procured in the course of the committee's investigations. Dr. Myers has also presented an album to the Anthropological Photographs Committee of the British Association which contains some four hundred photographs, full face and profile, of Egyptians and Sudanese. The committee asked for a grant of £35 to defray the services of a clerk, who, under Dr. Myers's supervision, will tabulate, average and determine the variability and correlation of the various series of measurements already collected.

The Scottish Ethnographic Committee (Mr. E. W. Brabrook, chairman) reported a delay in the 'Pigmentation Survey of the School Children of Scotland,' owing to the difficulty of procuring suitable lithographic color cards to be used as color scales for hair and eyes. The Educational Institute of Scotland has passed a resolution recommending the teachers to supply the information desired by the committee, an action which will be of immense value in expediting the survey. The subdivision of Scotland into 110 numbered districts has already been completed.

Papers relating to various fields of archeological research were read. Mrs. Stopes presented two papers, accompanied by exhibits of specimens, and relating to the last discoveries of her late husband. Of 'Paleolithic Implements from the Shelly Gravel Pit at Swanscombe, Kent,' she exhibited the large and small hache types, broad leaf-shaped type, discs, ovate types, awls, boat-shaped type, angular projectiles, graving tools, scrapers and spoke shaves, representing various shades of flint and patina-white, cream, ocherous, brown, black. Many of them are derived and water worn. The implements were found associated with a fauna containing many extinct species.

The 'Saw-edged Paleoliths' presented by Mrs. Stopes were from the Craylands gravel pit at Swanscombe. The serration is intentional and not a result of accident or use; is generally on a straight edge, though sometimes continued into spoke shaves and scrapers.

Mr. Llewellen Treacher's paper 'On the Occurrence of Stone Implements in the Thames Valley between Reading and Maidenhead' was read by Mr. Monckton, of the Geological Section. Mr. Treacher's investigations extend to the upper, middle and lower terraces, from all three of which important collections have been made.

Some of the megalithic monuments of Kent were discussed in Mr. George Clinch's communication entitled 'Coldrum, and its Relation to Stonehenge.' Mr. Clinch pointed out that the hitherto published descriptions of Coldrum do not mention its most important and characteristic feature, namely, that between the two upright stones which form the sides of the chamber there stand two stones about midway, forming a partition which divides the space into two sepulchral chambers. The two upright stones are of remarkable size. Their regular form, good proportions and flat surfaces are also noticeable features, suggesting artificial shaping and perhaps dressing. These point to a late epoch of the neolithic period, and present remarkable similarities to the forms at Stonehenge. The idea of enclosing the principal structure within a line of stones is also common to Stonehenge and Coldrum. But Coldrum was obviously a sepulchral monument. Stonehenge, on the other hand, though following to some extent the same arrangement, 'was conceived on a more ambitious scale, and probably designed for a very different purpose.'

The megalithic structures of Kent, in-

cluding Countless Stones, Kits Coty House, several ruined examples in Addington Park and Coldrum itself, furnish a valuable series illustrative of the constructive skill of neolithic man.* Here, as well as at Stonehenge, Sarsen stones were employed. In this connection may be mentioned Mr. H. Balfour's presentation of 'A Model of the Arbor Low Stone Circle.'

Cretan and Egyptian archeology were especially well represented; the former by Messrs. Arthur Evans, J. L. Myres and R. C. Bosanquet, including Dr. W. L. H. Duckworth's report on the prehistoric human remains of Crete (being part of his 'Report on Anthropological Work in Athens and in Crete'); the latter by Messrs. Flinders Petrie, Garstang and C. S. Myers.

Mr. Evans had thought to complete his excavations at Knossos this year. 'But the excavations took a wholly unlooked for development, productive of results of first-rate importance' both as regards architecture and general archeology, and calling for 'supplementary researches of considerable and, indeed, at present, incalculable, extent.'

Mr. John L. Myres's paper: 'On a pre-Mycenæan Sanctuary with Votive Terra Cottas at Palæokastro, in Eastern Crete,' was based on his excavations of April, 1903. The terra cottas were found in a layer of blackened ashy earth, the latter covered by a layer of disturbed soil and of rubble building of early Mycenæan date. The figurines are of 'men and women in characteristic pre-Mycenæan costume analogous to that shown by the frescoes at Knossos, and completed, in the case of the women, by gigantic and very stylish hats; a quite new feature.' There were other figurines representing oxen, rams, goats, pigs, dogs, weasels, hedgehogs, birds, chairs, vases and other objects of daily use.

'Exploration in the East of Crete' and 'An Early Purple-fishery,' both by Mr. R. C. Bosanquet, Director of the British School at Athens, completed the list of papers on Cretan archeology. Leuke, a small island off the southeast coast of Crete, was an important fishing-station in antiquity. An inscription of about 350 B.C. mentions the levying of tithes on the catch of fish and of purple-shell. Messrs. Bosanquet and C. T. Currelly explored the island last May. They found, among the sand-hills on the north shore, a bank of shells, 'some whole, but mostly crushed, of the variety *Murex trunculus*, which is known to have been used in the manufacture of the purple dye.' Fragments of pottery and of a stratile bowl which marked it as not only pre-Hellenic, but pre-Phœnician, were scattered through the heap. Further digging only a few yards away uncovered characteristic Cretan vases of the Kamáres type and the foundations of a house. Enough evidence was obtained to show that the "extraction of the purple juice was practiced in Crete at least as early as 1600 B.C. The Minoans of Crete, and not the Phœnicians, were the probable discoverers of 'Tyrian purple.'"

'The Temples of Abydos' and 'The Beginning of the Egyptian Kingdom' were the subjects chosen by Professor W. M. Flinders Petrie, and made doubly interesting by a long series of lantern views. 'Recent Discoveries, Illustrating some Burial Customs of the Egyptians,' by Mr. John Garstang, and 'Antiquities near Kharga in the Great Oasis,' by Dr. C. S. Myers, were also fully illustrated.

Romano-British archeology came in for a share of attention. Mr. T. Ashby, Jr., reported on 'Excavations at Caerwent,

* The writer took photographs of this series just before the Southport meeting. Unfortunately, the films were all destroyed in transit (post), through being opened, presumably by U. S. customs officials.

Monmouthshire.' This is the site of the ancient Venta Silurum. The external walls of the city are still clearly traceable, forming a rectangle of about 500 by 400 yards, and, on the south side, preserved to a height of some 20 feet. The buildings thus far brought to light consist chiefly of private houses, and some of these present a ground plan which appears to be unique in England, having the rooms arranged round all four sides of a rectangular courtyard.

The Roman sites described by Mr. Garstang, at Brough and Ribchester respectively, were of a different character, both being fortifications. That at Brough in Derbyshire belongs to the earlier class, and was built probably under Hadrian or Antoninus Pius. The Roman fortress Bremetenacum, at Ribchester, has been known since archeological records began to be kept in Britain. Recent excavations show that this station conformed with the general scheme of frontier defenses of the Roman Empire. It was one of the series of fortresses 'which, with the wall of Hadrian, formed the northern frontier defenses of Roman Britain.' On Saturday, set apart by the British Association as excursion day, Mr. Garstang conducted a party of ninety-five to Ribchester.

The two papers on American archeology were 'A West Indian Aboriginal Wooden Image,' by Dr. J. E. Duerden, and 'The Ancient Monuments of Northern Honduras, and the Adjacent Parts of Yucatan and Guatemala, with some Account of the Former Civilization of these Regions and the Characteristics of the Races now Inhabiting Them,' by Dr. T. W. Gann. Miss A. A. Bulley presented 'Some Points about Crosses, chiefly Celtic,' and Mr. Annandale discussed 'The Survival of Primitive Implements in the Faröes and Iceland.'

Personal ornaments among civilized peoples consist of precious metals and stones or imitations of stones, pearls or shells themselves, amber, jet and occasionally various other objects. It has been supposed, hitherto, that purely esthetic considerations led to the use of such objects for purposes of adornment. Professor W. Ridgeway, in 'The Origin of Jewelry,' endeavored to prove that such was not the case. He attributes their use to magic.

Small stones of peculiar form, color or properties were considered magical long before they were worn as ornaments. In Australia and New Guinea, crystals are used for rain-making, although the natives can not perforate them for use as ornaments. In Uganda these same rock crystals are fastened into leather and carried as amulets. In Africa, the sorcerer carries a small bag of pebbles as an essential part of his equipment. Modern cylindrical glass beads are descended from the beryl and quartz crystal. Babylonian cylinders, Egyptian scarabs and Mycenæan gems were not, as has been generally supposed, primarily signets, but amulets. "The Orphic Lithica gives a clear account of the special virtue of each stone, and it is plain that they acted chiefly by sympathetic magic; *e. g.*, green jasper and tree agates make the vegetation grow, etc. Mithridates had a whole cabinet of gems as antidotes to poison. To enhance the natural power of the stone, a device was cut on it, *e. g.*, the Abraxas cut on a green jasper, the special amulet of the Gnostics. The use of the stone for sealing was simply secondary, and may have arisen first for sacred purposes." Cowrie shells are worn as amulets by the modern savages in Africa; similar shells were worn in Strabo's time to keep off the evil eye. Red coral was a potent amulet to the seafarer, as it is at the present day in Mediterranean lands. If powdered, it kept red rust from grain. Pearls are still a potent medicine in China. Seeds of plants have magic properties, the

banana seed being especially valued in Uganda. Claws of lions are such important amulets in Africa that they are quite generally counterfeited. So with the teeth of jackals, which are imitated in wood, if the real thing is not to be had. When gold first became known, it was regarded exactly as the stones mentioned above. "Thus the Debae, an Arab tribe who did not work gold but had an abundance in their land, used only the nuggets, stringing them for necklaces alternately with perforated stones." Magnetic iron and hematite were particularly prized, the belief being that the former was endowed with a living spirit. "It is thus clear that the use of all objects still employed in modern jewelry has arisen primarily from the magical powers attributed to them, by which they were thought to protect the wearer."

Mr. Edward Lovett, in "Some Suggestions as to the Origin of the Brooch, and the Probable Use of Certain Rings at present called 'Armlets,'" suggests, as the prototype of the ring-and-pin contrivance for fastening a cloak, the use, by a hunting people, of the mammalian *os innominatum* and *os calcis*, the corners of the cloak being drawn through the oval perforation of the former, and pierced by the sharp point of the latter. It is further noted that very many rings of early date and of various materials, usually described as 'armlets,' are of too small diameter to allow the entrance even of an infant's hand. "As such rings are frequently found associated with pins of similar materials, commonly regarded as 'hair-pins,' and as ring and pin are sometimes found *in situ* on the breast of a skeleton, it is inferred that they represent a simple ring-and-pin fastening." It was pointed out that an apron fastener of this type, composed of an iron ring and a horseshoe nail, is still worn in some blacksmith shops of Scotland. The shepherds of Perthshire wear a brooch of similar pattern. The next step in the development is to be found in the ring-and-pin fastening so common at present in China. The ring is of agate, and the pin, which is of silver and perforated, is attached to it by means of a silken thread. A further step is taken when the pin itself is hinged upon the ring for security, by bending its flattened head around the ring, a form abundant in Celtic times.

There were a number of communications of general ethnological interest. Dr. W. H. Rivers presented two: 'The Toda Dairy' and 'Toda Kinship and Marriage.' From the ordinary operations of the dairy, the Todas of the Nilgiri hills have evolved an elaborate religious ritual. The priest is the dairy man; the temple, the dairy. The dairy temples are of different degrees of sanctity corresponding to the different degrees of sanctity of the buffaloes tended in each. Only the milk of the sacred buffaloes is churned in the dairy temple. The milk of those that are not sacred is churned in the front part of the huts in which the people live. "The more sacred the dairy, the more elaborate its ritual. The dairy vessels, in all, are divided into two groups, those which come in contact with the milk are the more sacred; those which receive the products of the churning, the less sacred. The kinship system and marriage institutions of the Todas were studied by means of the genealogical method." The system of kinship is 'classificatory,' every male of an individual's clan being his grandfather, father, brother, son or grandson, and every female his grandmother, mother, sister, daughter or granddaughter. As to marriage regulations, the people are divided into two endogamous groups, each of which is subdivided into a number of exogamous groups. There can be no marriage between the two chief groups; a man

must marry a woman of his own division but not of his own clan. The orthodox marriage is that of cousins. The institution of polyandry still exists. When a girl marries a boy it is usually understood that she becomes also the wife of his brothers. "For all social and legal purposes, the father of a child is the man who performs a certain ceremony about the seventh month of pregnancy, in which an imitation bow and arrow is given to the woman." "Fatherhood is determined so absolutely by this ceremony that a man who has been dead for several years is regarded as the father of any children borne by his widow, if no other man has given the bow and arrow." The author considers it possible that the Todas are moving from polyandry toward monogamy through an intermediate stage of combined polyandry and polygeny.

In 'The Ethnology of Early Italy and its Linguistic Relations to that of Britain,' Professor R. S. Conway discussed the various suffixes used by the various tribes to form names of communities derived from names of places. There are only six or seven suffixes used for this purpose in ancient Italy and, of these, only three are significant for ethnology, viz., -co, -no and -ti (generally -ati).

The remaining paper, 'The Progress of Islam in India,' by Mr. William Crooke, admitted the increase of Islam and endeavored to ascertain the cause or causes of it. One of these is physical, tending to make the Mohammedans more fertile and more long-lived than the Hindus. The former are recruited from a more vigorous race, discourage infant marriage and the celibacy of widows, and permit a more varied and invigorating diet.

In addition to the above program, a member of Section H, Dr. Robert Munro, was invited to deliver one of the evening lectures arranged for by the association. Dr. Munro's subject was 'Man as Artist and Sportsman in the Paleolithic Period.'

Mention should also be made of a number not on the published program, a special treat provided for the anthropologists by Mr. James Hesketh, of Southport. The city is built upon blown sand. Some years ago, while engaged in street or sewerage construction, workmen came upon a rather large wooden structure buried some ten or twelve feet beneath the surface of the ground. Mr. Hesketh, on whose property the find occurred, had extensive excavations made prior to the meeting, in order that visiting scientists might see to best advantage what proved to be a pile dwelling or perhaps a landing for boats. A large fragment of a willow mat or basket was found by the piles. It resembles the bird-cage weave of the Clallam Indians. The site is now between one and two miles from the sea.

George Grant MacCurdy.
Yale University Museum.

Societies and Academies.

Biological Society of Washington.

The 376th meeting was held on Saturday, November 14.

W. H. Dall called attention to the doubt expressed by Dr. True, in a recent number of the *Proceedings* of the Biological Society, as to the existence of dorsal and ventral keels on the posterior part of the body of *Phocæna dalli*. Without offering any comments as to the presence or absence of this character in other porpoises, Mr. Dall showed by the original notes and drawings made at the time of the capture of the type of *Phocæna dalli* that such keels were certainly present in this species.

Lester F. Ward noted a curious case of scientific prediction in which ten species were named and described before they were discovered. This was done by Ehrenberg, who in working on the diatoms, classed by him as infusoria, described a number of species of *Actinocyclus* based on the number of rays. For most of these he had specimens, but for

the species with 27, 29, 30, 31, 37, 39, 41, 42, 44, 45, 46, 48 and 49 rays no specimens had at the time been discovered. Ten of these were found in 1843 and 1844, but the last four seem never to have come to light.

G. K. Gilbert spoke of the twisting of the pines, *Pinus balfouriana,* observed by him in the Kern River region. In many trees the wood had a distinct spiral twist, usually to the right, and the branches twisted in the same direction; in the exceptional cases where the twist was to the left, the branches, as a rule, also followed this direction.

Lester F. Ward presented a paper on 'The Dresden Cycad' (*Cycadeoidea Reichenbachiana*), giving a brief historical account of the cycad trunk from the salt region of Galicia that has been in the Dresden Museum since its discovery in 1753. Its true character as a cycad was made known by Göppert in 1844, when he named it *Raumeria Reichenbachiana,* and he described and figured the specimen in 1853. More recently it had been photographed by Geinitz and a copy of the photograph sent to the speaker, who surmised that the cycad had been mounted in an inverted position, and so stated in his 'Flora of the Black Hills.' In August, 1903, Mr. Ward visited Dresden and had an opportunity to examine the specimen carefully, finding that it was really inverted. The speaker gave as minute a description of the trunk as was possible without cutting sections to show the internal structure, stating that it shows a number of reproductive organs that promise good results when they shall be cut through and examined microscopically.

Under the title 'The Making of a Whale' F. A. Lucas described the making of the mold of an adult sulphur-bottom whale and the preparation of its skeleton, illustrating his remarks by slides from photographs by Mr. William Palmer. He said that in May Mr. Palmer, Mr. Scolliek and himself had been sent to a whaling station on the southern coast of Newfoundland, and told how the whales were captured there and made into oil and fertilizer. The method of making the mold, he stated, had been devised by Mr. Palmer, who was at present engaged on the reproduction of the animal for the St. Louis Exposition. F. A. LUCAS.

THE PHILOSOPHICAL SOCIETY OF WASHINGTON.

THE 571st meeting was held October 10, 1903. The first regular paper was by Mr. G. W. Littlehales, of the Hydrographic Office, on 'The Locus of Geographical Position and the Compass Error,' depending on the use of special large-scale diagrams and avoiding calculation.

This communication points out a short and simple simultaneous solution, by inspection, of the altitude and azimuth of a celestial body due to an estimated geographical position of the observer.

The results, which are applied directly to the problem of laying down the Sumner line of position and finding the total error of the compass, are obtained with a degree of precision which is well within the margin of error that is inseparable from observations made at sea.

A navigator having measured the true altitude of a celestial body and then deduced the altitude and azimuth of the observed body due to the estimated geographical position of the ship, can draw a line upon his chart through the estimated geographical position of the ship at right angles to the azimuth or true bearing of the observed celestial body, which might be appropriately called the Sumner line of position by account; and next comparing the instrumentally measured true altitude with the altitude due to the geographical position, he can at once draw the actual Sumner line of position, since it will be sensibly parallel to the line of position by account and removed from it by a perpendicular distance equal to the difference in minutes of arc between the observed and deduced altitudes and toward the direction of the observed celestial body or away from it, according as the true altitude obtained by observation is greater or less than the altitude deduced by dependence on the estimated geographical position.

If the compass bearing of the observed celestial body be noted at the time the observation for altitude is taken, the difference

between this bearing and the true azimuth of the body, which is deduced simultaneously with its altitude, will give at once the total error of the compass for the course upon which the ship heads at the time when the observation is made.

Mr. J. F. Hayford reported on 'The Longitude of Honolulu; Various Determinations from 1555 to 1903.' The final telegraphic result is $10^h\ 31^m\ 27^s.24\ .06$. The errors $\pm$ of the many older determinations were pointed out and discussed.

President Gore then read a paper on 'The Political Parties and Policies of Germany'—a study during the past summer at the time of the elections. He pointed out the constitutional relations between the government and the Reichstag and gave an account of the four political groups—Conservatives, Liberals, Particularists and Social Democrats—with their seventeen subdivisions, and the principal features of their platforms. Major Dutton in discussing the paper compared the parliamentary bodies of various lands.

The 572d meeting was held October 24, 1903. Professor Simon Newcomb spoke on 'The Coming International Congress of Science and Art at St. Louis, September 19 to 25, 1904.' He referred to the dissatisfaction that had followed most former congresses and the desire to provide something different for St. Louis. Two features of the plan decided on are noteworthy: (1) The unity of science is to be emphasized by a single congress, though meeting in as many sections as may be necessary. (2) The principal speakers are to be invited to present papers on specific assigned subjects. This rendered necessary a grouping in advance of the subjects that might properly come before the congress. The practical grouping adopted by the administrative committee, consisting of Professors Newcomb, Münsterberg and Small, was published in the May *Atlantic*.

During the past summer that committee has been visiting the learned men of Europe to secure participants in this congress; a considerable number of prominent scholars has been secured, each representing his special field.

President Gore, in the following discussion, pointed out that a congress was a proper adjunct to an exposition, for it represented the theoretical side of those activities whose practical side was represented by the exhibits.

Professor F. W. Clarke then spoke on 'The Dalton Centenary at Manchester' in commemoration of the announcement of the atomic theory, October 21, 1803. The speaker had delivered the memorial address, and here summarized it, pointing out the significance of Dalton's discovery. (The address was published in Science, October 23.) Sundry incidents of the festival were spoken of, and the fact noted that the statues in the fine town hall were not those of soldiers, but of scientific men—Dalton and Joule.

Professor Clarke added some account of the International Congress of Applied Chemistry at Berlin, and of his visits to various fine new laboratories; though he found none finer than some in this country.

President Gore told of his attendance at a meeting of the Berlin Academy of Sciences when memorial addresses were made on Virchow, and of the curious coincidence that he had also been present when Du Bois Reymond introduced the newly elected Virchow to the society.

Charles K. Wead,
Secretary.

New York Academy of Science,
Section of Anthropology and Psychology.

The regular meeting of the section was held October 20, in New Haven, Conn., in conjunction with the New York Branch of the American Psychological Association and the Philosophical Club of Yale University. The following papers were presented:

Localization of Brain Function: Dr. S. I. Franz, of Dartmouth Medical College.

Dr. Franz presented an account of an attempt to determine by physiological experiments whether or not the so-called motor areas are also sensory in function. Cats were used in the investigation, and the results indicate that in these animals the motor cortex has also certain sensory functions. It was not determined with what sensory processes

the areas are concerned, but results of clinical observations made it appear probable that the center for muscle sense is there localized.

The Application of the Concept of Variability in Reaction-Time Work: Dr. ROBERT YERKES, Harvard University.

Inasmuch as the degree of constancy of reaction-times differs for different species, individuals, conditions of the individual, modes and intensities of stimulation, it is clear that variability is an important quantity in the analysis of reactions, which should make possible the quantitative estimation of the influence of the various factors which play a part in determining the time of reaction.

The mean or average variability is generally determined in recent studies of reaction-time, but of far more importance for comparative work is what may be known as the relative variability. This quantity is an index of variability, which gives not the absolute variableness of the reaction-time, but the ratio of the variability to the time of reaction. For reaction-times, which are symmetrically distributed about a mode, the relative variability may be gotten from the formula

$$\frac{\text{mean variability} \times 100}{\text{mean}}.$$

In case of asymmetrical distribution Pearson's formula for obtaining the coefficient of variability should be used.

Examination of reaction-time statistics in which the variability is given indicates that the relative variability, as well as the time of reaction and the mean variability, decreases with increase in the strength of the stimulus. For electric stimulation this appears to be true from the threshold intensity to that which causes a reflex reaction, but in case of other modes of stimulation it is possible that beyond a certain point increase in intensity of the stimulus causes slower and more variable reactions.

Since the time of reaction varies with the intensity of the stimulus it is useless to compare reaction-times for different modes of stimulation, or those of different species or individuals, unless the relative variability is known. It is not improbable that careful investigation of the relation of relative variability to reaction-time will furnish a satisfactory basis for the accurate comparison of different results. To say that one person reacts more quickly than another to a given stimulus without taking into account the variability of the reaction-time is meaningless.

The 'Specious Present' and the Real Present: Dr. W. P. MONTAGUE, Columbia University.

A psychosis, like all systems, possesses in its totality a form or structure which is distinguishable, as the perceiving subject, from its individual contents, as perceived objects. Changes in the individual contents produce concomitant, though generally lesser, changes in the totality. The segment of duration or change perceived at any one moment is not itself a real change, but simply the *ratio of the change-rate of the individual contents to the change-rate of the totality, at that moment;* and this ratio, though finite and variable, does not itself require a finite time for its realization. Each unextended moment of 'real' time is thus adequate for the appreciation of an extended period of perceptual or 'specious' time.

The Effects of Practice on the Poggendorff Illusion: Mr. E. H. CAMERON and Mr. W. M. STEELE, Yale University.

This paper reported the results of a series of experiments dealing with the effect of practice on the Poggendorff illusion. (1) Quantitative determinations were made with a number of illusions; (2) practice with one illusion was carried on for an extended period; (3) determinations were again made with all of the illusions which were used before the practice series.

The apparatus used was demonstrated. The results show that the illusion tends to disappear after a period of seven weeks' practice. The effects of such practice were found to hold good for figures other than that with which the practice was made.

The Zöllner Figure: Dr. CHARLES H. JUDD, Yale University.

This paper reported a series of quantitative determinations of the amount of illusion in the Zöllner figure when the figure was rotated

through 360 degrees and was divided so that the illusion for each of the long lines was determined without reference to the next long line. It was found that the illusion is not the result of equal deflections in opposite directions of the neighboring lines. In some cases one of two neighboring lines is not deflected at all, or even in a direction opposite to that usually assumed. The important deflection is in every second long line. Rotation through various angles shows that there are four positions in which deflection is great, four in which it is small.

Statistics of American Psychologists: Professor J. McKeen Cattell, Columbia University.

Professor Cattell described the methods he has employed to select 1,000 American men of science for scientific study. Among about 4,000 scientific men, there are about 200 psychologists. The methods by which they were arranged in the order of merit were explained, and the possibility of measuring degrees of scientific merit by the positions and probable errors was discussed. Some statistics were then given in regard to the academic origin, course and distribution of the psychologists. They were educated at 76 different colleges, this large dispersal indicating that in general psychologists are not greatly influenced by the institutions at which they study. The numbers who pursued graduate studies at different institutions were: Berlin 35, Leipzig 35, Columbia 31, Clark 31, Harvard 30, Cornell 25, Yale 16, Johns Hopkins 13. Of the 200 psychologists, all but eight are engaged in teaching or administrative educational work, being distributed among 77 institutions. Statistics were also given in regard to publications, from which it appears that the United States contributes about one seventh of the more important publications, leading in experimental psychology. The paper will be published in the *American Journal of Psychology.*

The Participation of the Eye Movements in the Visual Perception of Motion: Professor Raymond Dodge, Wesleyan University.

Photographic registration of the eye movements has exposed the poverty and inaccuracy of all introspective data with respect to their number, velocity and amplitude. While it shows that, even if our consciousness were full and exact in all three respects, it would be either useless or misleading as a datum in the visual perception of motion.

Every pursuit movement of the eyes is a definite muscular reaction to retinal stimulation. As such it is evidently conditioned both in direction and in velocity by some definite characteristics of the stimulus which occasions it. Since its accuracy can never transcend the accuracy of the data on which it occurs, it follows that the kinesthetic factor from a reactive pursuit movement could never correct nor materially augment the data furnished by the stimulus.

Moreover, the reaction of the eye involves a long reaction interval, about 160–170 σ. This suggests both the relative unimportance of the actual motor response and a considerable elaboration of the sensory data in what seems like a simple reaction. But any reaction interval at all renders it impossible for the actual eye movement to parallel the movement of the object of interest either in velocity or in amplitude.

Experimental verification of the above takes two forms: Whenever all other sensory data for the perception of motion are suppressed, except the hypothetical kinesthetic factor, there is no immediate perception of motion. And whenever the former are distorted by eye movements, the appearance of motion is respectively decreased or increased, entirely without correction by kinesthetic data.

On the Horopter: Dr. Geo. T. Stevens, New York City.

A horopter will be formed when the two eyes are so adjusted as to enable the image of the point fixed to be located exactly at the maculas of the two retinas. It follows that horopters succeed each other in endless variety and with amazing rapidity. With every glance a new horopter is developed. Two tenets constitute the essential foundation for the doctrine of the horopter the theory of actually horizontal and actually vertical meridians of the retinas and a doctrine of corresponding points.

Corresponding points of the two retinas are those which answer to proportional degrees of rotation of the eyes about the center of rotation, and which, from given individual points in the plane of fixation, each receive incident rays which must pass through the nodal points. They represent, therefore, the relation between the muscular and the retinal senses.

Intelligence and Movement: Dr. R. S. WOODWORTH, Columbia University.

In discussing the relations of 'Intelligence and Movement,' Dr. Woodworth argued that the mental cue of a voluntary movement was not ordinarily a kinesthetic image of the movement. Even in learning a new movement, experiment shows that no such image need be present. Since voluntary movement is developed from instinctive, the original mental cue must have been that provided by instinct, and the instinctive cue is never an image of the movement about to be made. The actual sensation of a movement can evidently not be the stimulus to that same movement, and the reproduced sensation can hardly have a motor power not possessed by the sensation itself.

The Minimal Value of the Psychophysical Reaction-Time: Professor LIGHTNER WITMER, University of Pennsylvania. Read by title.

Primary and Secondary Presentations: Mr. H. R. MARSHALL, New York City. Read by title.

JAMES E. LOUGH,
Secretary.

SECTION OF ASTRONOMY, PHYSICS AND CHEMISTRY.

AT the meeting of the section on November 2, Dr. Bergen Davis read a paper on 'The Electrical Conductivity and Absorption of Energy in the Electrodeless Discharge.'

The discharge was produced in a globular vessel by the high frequency discharge from a Leyden jar system. The vessel in which the discharge was produced contained electrodes which were connected through a galvanometer to a source of E.M.F. of 220 volts. When the discharge passed in the vessel, the gas became a good conductor. The conductivity as indicated by the galvanometer was found to depend on the pressure of the gas somewhat. That is, when the pressure becomes so low that the white discharge appeared, the conductivity increased to near a maximum. It remained nearly constant until at a low pressure the discharge disappeared, when the conductivity became zero.

The absorption of energy was measured by placing a hot-wire galvanometer in the circuit leading from the jars to the coil surrounding the vessel. The oscillating current passing through this galvanometer and coil can be expressed by

$$c\,Ae^{-qt} = \cos pt.$$

The greater part of the energy is dissipated in heating the gas and the vessel. The energy will be proportional to the square of the current, while the galvanometer reads current direct. Hence

$$\text{Reading} \propto \int_0^\infty e^{-2qt} \cos pt\,dt,$$

$$\text{Readings} \propto \frac{2p^2 + 3q^2}{4q(p^2 + q^2)},$$

$$\text{Readings} \propto \frac{1}{q}.$$

That is: a certain reading is obtained without the vessel in the coil. When the discharge passes in the vessel, the readings drop back to a smaller value. This drop-back is proportional to the dissipation q in the circuit. The energy absorbed reaches a maximum near the pressure at which the discharge first appears. It steadily decreases and becomes zero again at the pressure at which the discharge disappears.

A second paper was read by Dr. Charles Lane Poor, on 'The Measurement of Racing Yachts.'

The measurements discussed in this paper are made for the purpose of classifying the yachts and furnish a basis for handicapping them in racing. From such measurements, made of the hull, spars and sails, an expression is found for the 'theoretical speed,' or speed the yacht should make under normal conditions. While every little detail of hull and rigging contributes its part in producing a fast yacht, yet it is manifestly impossible to take account of all such details in finding the

'theoretical speed'; only the main factors can be considered. These factors, which enter the rules in common use, are length of hull, sail area and displacement.

It was shown that the rules introduce these factors in such a way as to involve the assumptions that speed is proportional to: (*a*) The square root of length; (*b*) the fourth root of sail area; and that the New York Yacht Club rule involves these two assumptions and the additional one that speed is proportional to (*c*) the inverse sixth root of displacement.

Dr. Poor discussed these assumptions in detail and showed that, while there is some apparent basis for the assumption in regard to length, there appears to be no scientific basis for those in regard to sail area and displacement. In fact, the available data seem to point to the conclusion that the assumption in regard to sail area is wrong, that speed is more nearly proportional to square root of sail area. In support of this view the results of many races between two yachts in 1902 and 1903 were used. Dr. Poor called attention to the scientific aspect of the problem, and suggested several lines of experiment, by means of which the relationship between speed and the factors of measurement could be determined.

S. A. Mitchell,
Secretary.

Clemson College Science Club.

At the meeting of October 17 Dr. R. N. Brackett discussed 'An Improved Welsbach Mantle.' A brief historic review of Welsbach's work in originating and perfecting the mantle which bears his name was given. The experiments in varying the proportions of the rare earths and observing the effects produced were mentioned. As a result of these experiments, the best results seem to be obtained with a mixture of the rare earths in the proportion of approximately 99 parts of thoria to 1 part of ceria. The explanations which have been offered for the phenomena observed in the use of the mantle were mentioned. The recent improvements by which the mantles have been hardened and thus adapted to use in railway trains, etc., were pointed out.

Professor Chas. E. Chambliss read a paper entitled 'A Destructive Rice Pest.' The speaker referred almost exclusively to his own observations made in the rice fields during the early spring and late summer. The pest to which reference was made was the bird known locally as the rice bird, and in the north as the bobolink. The habits of the bird in the rice fields of the south, where it stops only on its way to and from South America and the northern United States, where it breeds, were mentioned. Also the extent of the damage done by the birds on their first and second visits to the fields was pointed out. The two methods in use at present for combating this pest were given. These consist in tarring the grain, previous to sowing, and in frightening the birds by the explosions of firearms. The first method is used only in a limited way, the second being the one almost universally employed. The speaker referred to the inefficiency of both methods, and according to his observations the bird is more easily frightened by the passing of shadows than it is by firearms. The possibility of the use of trained hawks for combating this pest was pointed out.

The next and last paper on the program was 'Cultural Studies of a Nematode,' by Dr. H. Metcalf. Under this title there was given an account of investigations into the cause of decay and 'damping off' in a number of different plants. A nematode, a *Fusarium* and several bacteria were found associated with the disease. It was necessary to devise special methods for isolating the nematode. Final results of inoculation indicated that the plant organisms were the direct cause of the decay, but that the nematode played an important part in spreading the infection. By way of illustration living specimens of the nematode were projected on the screen. This paper will be published in the *Proceedings of the American Microscopical Society.*

F. S. Shiver,
Secty.-Treas.

Clemson College, S. C.,
October, 1903.

DISCUSSION AND CORRESPONDENCE.

A VISUAL PHENOMENON.

TO THE EDITOR OF SCIENCE: Dr. Gould's interesting statement concerning a 'hitherto undescribed visual phenomenon' induces me to add the following note. In 1897 during a month's inspection of the Ural region under the auspices of the Russian government, our special train stopped one night on a side track near a station on the Siberian border. Some of our party were attending an entertainment given at some distance and expected to return on foot during the night, which was dark, with a slight drizzling rain. At about ten o'clock I was watching, through a glass window in the rear of the car, a light which I supposed to be a lantern in the hands of my returning fellow travelers. There was no other light visible, and as I looked, it seemed evident that the light was descending the face of a far sloping hill reaching to the railway; but the motion was by a series of lateral jerks first to the right and again to the left, each excursion, however, bringing it, *apparently*, lower and nearer. At first the motion amused me, later it interested me, and when, after steadily observing the phenomenon for a considerable time, I found the light had actually not moved from the spot where I first saw it, I was astonished. In this frame of mind my friend, Professor I. C. White, found me, and not being able to see what I described, doubtless formed an opinion of me as unjust as mine was of the supposed revelers who seemed to be coming home in a decidedly zig-zag course. On my return to Philadelphia I described the phenomenon to Dr. de Schweinitz and others. I found I could reproduce the delusion at will by looking from any dark place at a single light; as, for instance, on a cloudy night from the sea beach at the distant light of a ship on the horizon. Whether looked at with one eye or with two, the light always gives the impression of moving by jerks either sidewise or vertically, but in the former case it always seems to progress slowly downward or upward.

Under the conditions above described the phenomenon appears not to be controllable by the will. PERSIFOR FRAZER.

SHORTER ARTICLES.

CORTICIUM VAGUM B. AND C. VAR. SOLANI BURT. A FRUITING STAGE OF RHIZOCTONIA SOLANI.

A STUDY of the *Rhizoctonia* of the potato was begun by the Colorado Experiment Station in the spring of 1901. It soon became evident that it is not a sterile fungus and much time has been given to the discovery of a fruiting stage. Observations show that potato plants developed from tubers which are more or less covered with sclerotia of this fungus usually have their subterranean parts overrun with a dark brown cobweb-like mycelium. This covering frequently extends up the green stems from one to three inches above the ground, forming a thin hymenial layer which is usually gray-white in color. This layer does not adhere firmly to the stem and cracks very easily when it becomes dry, consequently it disappears soon after the death of the plant.

The tip of the outermost branches of this hymenial layer become changed into basidia, bearing from two to six sterigmata. The spores are hyaline, and usually ovate in form, with apiculate bases. Fifty spores taken just as they occurred on a green stem gave an average measurement of 10 by 6 μ. But spores after they had fallen averaged 12 by 8 μ. Thus far a pure culture of this fungus has not been obtained directly from spores, but cultures made from the hymenial layer invariably produce a luxuriant growth of *Rhizoctonia*.

The main character of this green stem form agrees with *Corticium vagum* B. & C., but on account of the spore differences and parasitic mode of life, it has been thought wise to make a variety of this form for which Dr. E. A. Burt has suggested *Corticium vagum* B. & C. var. *solani*. It also agrees closely with the description of *Hypnochus solani* Prill & Del, and they may eventually prove to be the same.

FORT COLLINS, COLO., F. M. ROLFS.
October 19, 1903.

RESULTS OF THE RESURVEY OF LONG ISLAND, NEW YORK.*

NOTWITHSTANDING Long Island has been many times studied by geologists a considerable

* Published by permission of the Director of the United States Geological Survey.

number of new facts, some of them of quite far-reaching importance, were established by the resurvey of the island by the Division of Hydrology,* United States Geological Survey during the past summer. The more important results are included in the following summary:

1. Long Island, instead of consisting almost entirely of glacial deposits, as was once thought, is now known to possess throughout a large portion of its extent a core of older Cretaceous beds, rising in places to nearly 300 feet above sea level.

2. These Cretaceous beds are not limited to the north shore, as has frequently been supposed, but rise nearly to the tops of the highest hills and extend far to the south, either at the surface, as in the West Hills, or at slight depths beneath the gravel plain on the south side of the island.

3. This Cretaceous nucleus has been found to have been deeply eroded before the deposition of the earliest glacial deposits.

4. The present field work has led to the discovery of greensand in the West Hills, thereby suggesting if not establishing the Upper Cretaceous age of the deposits in question. A considerable thickness of the underlying black and chocolate clays may also be of the same age.

5. The dip of the Cretaceous of the north shore has been determined for the first time, well records showing it to be, in the Oyster Bay region, south 23° east and about 65 feet per mile.

6. The absence of the great masses of Tertiary clays and gravels, assumed to be present by earlier workers, was established beyond question.

7. The yellow gravels formerly assigned to the Tertiary, and considered as constituting a considerable mass overlying the supposed Chesapeake (Tertiary) clays, have been shown to constitute the first of the glacial series (probably Pre-Kansan) of the Quaternary, and normally to underlie the clays instead of overlying them. The gravels were greatly eroded before the deposition of the clays, the deep valley reaching 280 feet below the present sea level which underlies Jamaica, and Jamaica Bay, and which seems to be the logical continuation of the submerged valley shown by the soundings of the Coast and Geodetic Survey off New York harbor, probably being completed if not largely formed at this time.

8. The supposed Chesapeake clays have been differentiated into three distinct formations: the first including the clays near Bethpage and Wyandance being referred to the Cretaceous; the second comprising the buried clays beneath Jamaica and Jamaica Bay belonging to an early interglacial (probably Yarmouth), and the third including East Williston and similar clays to the late glacial (Wisconsin) stage.

9. The portion of the supposed Chesapeake clays beneath Jamaica, Jamaica Bay, etc., were shown to be underlain by glacial gravels of the second ice invasion (probably Kansan), while the clays themselves were proved to have been deposited in the interglacial period (Yarmouth) between the second and third invasions. The area of the clays has been traced out by borings, and the clays themselves shown to represent salt marsh, or submarine deposits formed around the Cretaceous core when the land stood fifty feet higher than at present.

10. The known areas of the Manhasset gravels have been greatly extended to the south and east, having been recognized at Rockaway Ridge, Barnums Island, Bethpage, Half Hollow Hills and eastward beneath Shelter Island, and on the south fluke nearly to Montauk. Its age is probably Iowan.

11. The Manhasset gravels have been proved normally to underlie the moraines instead of resting against them as has sometimes been urged. Actual sections showing the relations were found.

12. Very little of the total height of the ridges is generally due to the morainal deposits themselves, the moraines either resting upon or constituting a coating over the older Manhasset, Pensauken or Cretaceous beds constituting the main mass of the elevations.

* Executive and areal work was in charge of M. L. Fuller, and the underground geology and water problems were in charge of A. C. Veatch.

13. The outwash deposits of the two Wisconsin stages are likewise relatively thin, being generally underlain at slight depths by one or the other of the older formations described.

14. Three groups of artesian wells have been recognized: (1) the deep Cretaceous wells, (2) wells in the Jameco gravels, and (3) shallow wells in the Pleistocene deposits of the north shore.

15. The deep Cretaceous wells are found both on the north and south shores. In both localities the water horizon has a regular southeastward dip. The source of the water in the south shore wells, except in the Barren Island well, is probably in the highlands of the island itself where the beds rise to the surface. In the north shore wells and in the Barren Island well, which perhaps obtains its supply from the same water-bearing horizon, the original source of the water is not yet established, although the problem is under investigation.

16. The Jameco wells obtain their supply from the glacial gravels (Kansan) occupying the deep and well-defined channel extending beneath Jamaica and Jamaica Bay and underlying the thick clays of the succeeding (Yarmouth) interglacial stage. The supply is derived from the ground water entering the gravels under the landward edge of the overlying clay. Because of the coarseness of the gravel the water is given up freely.

17. The shallow north shore artesian wells are generally restricted to the upper halves of the deep reentrant bays, generally at the base of steep slopes. The source of supply is from the ground water of the glacial gravels and sands, the flow taking place by virtue of the freer passage afforded by the wells than by the gravels.

18. The great thickness of the sandy layers of the Cretaceous under the higher portions of the island, the extent to which the Cretaceous water-bearing sands have already been developed and the probability that a number of water horizons have been previously overlooked because of search for a coarse gravel like the Jameco, makes the recommendation made by Professor C. S. Slichter regarding the advisability of sinking deep wells with casing perforated at each water-bearing horizon particularly pertinent.

M. L. FULLER,
A. C. VEATCH.

CURRENT NOTES ON METEOROLOGY.

BLOOD COUNTS AT HIGH ALTITUDES.

Nos. 8 and 9 of Vol. III., *Bulletin of the Hadley Climatological Laboratory of the University of New Mexico,* deal with 'Cold as a Causal Factor in the Blood Changes due to High Altitude,' and with 'Further Observations on Increased Blood Counts due to High Altitude.' The first paper is by John Weinzirl, M.S., and the second, by the same author with the cooperation of C. E. Magnusson, Ph.D., is a study the prosecution of which was aided by a grant from the Elizabeth Thomson Fund. The fact of an increased number of red blood corpuscles at high altitudes is well known, and has been investigated by Bert, Egli-Sinclair, Viault, Müntz, Egger and others. By means of blood counts in the cases of human beings and of rabbits, the authors of these papers come to the conclusions that cold is an important, though not the only, factor in producing blood changes at high altitudes, and that the increase in the number of red corpuscles due to altitude is temporary (as, it should be noted, has already been shown by several writers), this temporary increase being very largely due to the change in the temperature and not to the diminished pressure.

WEST INDIA HURRICANES.

ON the 'Pilot Chart of the North Atlantic Ocean' for September last there is a brief but well-arranged summary of the most important facts regarding West India hurricanes, prepared by James Page, of the United States Hydrographic Office (reprinted from H. O. Publication, No. 86). Of 56 hurricanes recorded by the Hydrographic Office between 1890 and 1900, 41 occurred in September and October. Instead of the old 'Eight Point Rule,' which is now known to hold only for the central portion of the storm, seamen are at present instructed that 'six

points (67° 30′) have been accepted as the value most frequently met in actual practice.' Taking this value, the following rule approximately fixes the bearing of the storm center from a vessel in the northern hemisphere: Stand with back to the wind; the storm center bears six points to the observer's left. It is, nevertheless, perfectly clear that the angle between the wind direction and the gradient often differs considerably from this average value, not only in different storms, but also in different parts of the same storm. No simple rule of thumb can ever replace the careful judgment of the individual seaman who has a good understanding of the law of storms, and who makes an intelligent use of his own local meteorological observations.

CLOUD OBSERVATIONS AT SIMLA.

Cloud observations and measurements were made at Simla during the twenty months from June, 1900, to January, 1902, under many disadvantages of unfavorable weather and lack of time on the part of the observers. Photogrammeters were used, but only about 47 fairly good observations were obtained during the period. The average heights above sea level, and above Simla, of the clouds for the year were as follows:

Cloud.	Above Sea Level.	Above Simla.
Cirrus	37,664 feet.	30,440 feet.
Cirro-cumulus	25,083 "	17,859 "
Cumulus	14,528 "	7,304 "
Fracto-cumulus	13,143 "	5,919 "

These heights do not agree very closely with those previously obtained at Allahabad (Indian Met. Memoirs, Vol. XI.). Cirrus clouds are most frequent at Simla between 16,000 and 40,000 feet above the earth's surface, and the other forms of cloud between 16,000 feet and the surface. (W. L. Dallas: 'Report on Cloud Observations and Measurements at Simla,' Ind. Met. Mem., XV., Part II., Calcutta, 1903.)

R. DeC. Ward.

SANITATION AND THE PANAMA CANAL.

A small committee representing the American Medical Association, the American Association for the Advancement of Science and the New York Academy of Medicine, called on President Roosevelt, November 25, for the purpose of presenting resolutions passed by the organizations mentioned, urging the President to appoint upon the Panama Canal Commission a medical man who shall be an expert sanitarian.

The committee consisted of Drs. Musser, of Philadelphia, Welch and Osler, of Baltimore, and Bryant, of New York, representing the American Medical Association; Dr. Howard, of Washington, representing the American Association for the Advancement of Science; Dr. A. H. Smith and Dr. Loomis, representing the New York Academy of Medicine.

The resolutions were presented to President Roosevelt by Dr. Welch, who made a brief statement urging that the sanitary problem connected with the building of the canal was quite as serious as the engineering problem and pressing the point that a medical expert should be a member of the commission rather than a servant of the commission.

The views of the joint committees were received by the President with interest, but while he was evidently perfectly aware of the enormous importance of the sanitary problem connected with the project, he gave no assurance that he would adopt the specific suggestion of the committees.

RESOLUTIONS OF THE FACULTY OF CORNELL UNIVERSITY ON THE DEATH OF PROFESSOR ROBERT H. THURSTON.

The faculty and instructing staff of Cornell University wishing to give voice to the sentiments evoked by the death of their colleague and friend, Professor Robert Henry Thurston, Director of Sibley College, have directed the following to be entered upon the records of the university faculty and communicated to his family.

Professor Thurston came among us in 1885 when the university had barely entered upon its present era of development, and the college over which he came to preside was still small in numbers and poor in equipment. During the eighteen years of his labors he witnessed the progress of the university in all of its de-

partments and the remarkable growth of Sibley College. His own contribution to this splendid result can hardly be over-estimated. To his wise and farsighted policy and his tactful and efficient administration is due in greatest measure the development of Sibley College, which now constitutes the largest unit in our university organization and holds an assured place among the foremost technical schools of the world.

In all his relations to general university problems he exhibited the spirit of the scholar and the wisdom of the man of affairs. Serene in temper, sound in judgment, swift and certain in action, he justly exercised a weighty influence in all our counsels.

As a colleague he exhibited an interest in all good learning that bespoke the true scholar and the generous fellow-worker.

As a friend and companion he manifested a cordial sympathy that attracted all who knew him and held them in the bonds of an increasing affection.

In all the relations of life he moved upon the higher levels and showed forth the better qualities of our nature.

His loss falls heavily upon us, his colleagues and friends; upon the college whose head he was; and upon the university in whose history he has borne a distinguished part. It falls most heavily upon his family, whose grief we share, and to whom we desire to express our profound and sincere sympathy.

T. F. CRANE,
E. W. HUFFCUT,
W. F. DURAND,
Committee.

ITHACA, N. Y.,

SCIENTIFIC NOTES AND NEWS.

A COMMEMORATIVE number of *The American Journal of Psychology* has been issued, in honor of President G. Stanley Hall on the occasion of the twenty-fifth anniversary of his attainment of the doctorate of philosophy. The volume contains twenty-six papers by colleagues and former students and extends to 434 pages. A portrait of President Hall is given as a frontispiece. The dedication reads "To Granville Stanley Hall, founder of the first American laboratory for experimental psychology and of the first American journal for the publication of the results of psychological investigation; pioneer in the systematic study of the mental development of children and the application of its results to educational practice; ardent inspirer of others in the zeal for new knowledge—in commemoration of the twenty-fifth anniversary of his attainment of the doctorate in philosophy, this collection of papers is dedicated conjointly by colleagues and former pupils."

DR. HANS GADOW, Strickland curator of the University Museum and lecturer on advanced morphology and vertebrata at Cambridge University, England, has accepted an invitation of the Lowell Institute, Boston, to give a course of six lectures beginning March 29, 1904, on 'Coloration of Amphibians and Reptiles.' Dr. Gadow will probably give other popular lectures on zoological subjects while he is in this country.

DR. M. E. JAFFA, of the University of California, was elected president of the Association of Official Agricultural Chemists at their recent meeting in Washington.

DR. E. H. RUEDIGER, of the Memorial Institute for Infectious Diseases, Chicago, has been appointed assistant in the Serum Institute, Manila, P. I.

OSMOND E. LEROY, of the Geological Survey of Canada, has been appointed geologist to the Chinese Department of Mines, and leaves for Shanghai this month. Mr. Leroy is a graduate of McGill University and was assistant in geology in that institution for several years. During the past two seasons he has been engaged with Dr. Barlow in a detailed geological study of the nickel areas in the district about Sudbury.

MR. W. M. MACMILLAN, of St. Louis, will start this week for Egypt in order to explore the course of the Blue Nile. The party will embark in launches at Khartum and proceed to the furthest navigable point, where it will land and continue the explorations in the direction of Lake Rudolf.

PROFESSOR W. J. HUSSEY, of the Lick Observatory, has for some time been engaged in

astronomical observations at Canoplas, N. S. W.

Commander Robert E. Peary, U.S.N., Lieut.-Commander William S. Sims, Lieut. H. A. Bispham and Surgeon Henry G. Beyer, U.S.N., who have been inspecting the barracks system of British and German naval stations with a view to determining the advisability of building similar barracks at the navy-yards in this country for the housing of seamen to take the place of receiving ships, have returned to America.

Dr. R. D. Murray, of the Public Health and Marine Hospital Service, died in Laredo, Texas, on November 22, at the age of sixty-four years. His death was the result of the runaway accident noted in the last issue of this journal.

Mr. Andrew Carnegie had offered to give $300,000 to New Haven for a public library if the city would appropriate $30,000 a year to maintain it. It will be accepted by the city, but legislative power will first have to be obtained.

The Warren Triennial Prize of the value of $500 will be awarded next year for a research on some topic in physiology, surgery or pathology. Particulars may be obtained from Dr. H. B. Howard, Massachusetts General Hospital, Boston.

There will be a civil service examination on January 5, 6 and 7, 1904, for mammal taxidermist in the U. S. National Museum at a salary of $900 a year.

The American Society of Mechanical Engineers will hold its forty-eighth annual meeting in New York City on December 1–4. President J. M. Dodge will deliver an address on 'The Money Value of Technical Training.'

The American Historical Association and the American Economic Association will hold their annual conventions in New Orleans, La., on December 29, 30 and 31.

The Röntgen Ray Society meets at the University of Pennsylvania on December 9 and 10.

The fourteenth International Congress of Americanists will meet at Stuttgart from August 18–23, 1904. Dr. Karl von den Steinen is president of the committee on organization. The vice-presidents are Count von Linden and Dr. Eduard Seler. The subjects to be discussed by the congress relate to (*a*) 'The Native Races of America; their Origin, Distribution, History, Physical Characteristics, Languages, Inventions, Customs and Religions'; (*b*) 'The Monuments and the Archeology of America'; (*c*) 'The History of the Discovery and Occupation of the New World.' Communications may be oral or written, and in English, German, French, Italian or Spanish. The time allowed for each paper shall, as a rule, not exceed twenty minutes; but exceptions may be made for subjects of particular interest and general importance. For the discussions the limit of time is five minutes. All papers presented to the congress will, on the approval of the bureau, be printed in the volume of Proceedings. Members are requested to send in the titles of their papers to the general secretary as soon as possible. Abstracts, which may not exceed 1,000 words, of any paper accepted for the program, should be sent in before July 1; they will be printed in the daily bulletin during the session. Applications for membership in the congress, the cost of which is $3.00, should be made to the secretary, Dr. Kurt Lampert, Archivstrasse, 3., Stuttgart.

The steamship *Gauss* has safely arrived at Kiel after its Antarctic expedition.

The Antelope House at the New York Zoological Park was open to the public on November 26. The building, which is 142 x 78 feet, has been erected at a cost of about $80,000.

The British Medical Journal states that the botanical part of the Museum of Natural History of Owens College has just been enriched by the gift of one of the governors of the college, Mr. J. Cosmo Melvill, of this General Herbarium of the World. It embraces one third of all known plants, about 40,000 species, exhibited through half a million specimens, gathered from most parts of the world, arctic, temperate and tropical. It is one of the three last private herbaria existing in Great Britain, and the only one of the three

which extends its area beyond the palearctic region. Of the 7,500 recognized genera of plants it contains 5,000, and many subgenera.

THE Geophysical Institute at Göttingen, which is the only one of the kind in Germany, is about to be enlarged by an additional wing.

THE London *Times* states that Dundee whalers which have returned from Davis Strait make reports concerning the Ericksen (Danish) and Amundsen (Norwegian) expeditions. On June 26 the whalers *Eclipse,* Captain Milne, and *Diana,* Captain Adams, met at Dalrymple Rock, near Smith's Sound, where they had a rendezvous with Captain Amundsen. They found no signs of the explorer, but by arrangement left a large quantity of stores. Since he left Norway nothing has been heard of Amundsen. He was expected to touch at the Danish settlements on the west coast of Greenland. The past summer is memorable in whaling records, the winds and ice conditions rendering the passage to the north extremely hazardous. It is feared that disaster may have overtaken Amundsen's little craft, but experienced whalemen state that if he has kept to the west side of the straits he may have escaped the great ice. When in the neighborhood of Dalrymple Rock, Captains Milne and Adams fell in with Ericksen and his company. They were in Saunders's Island, and were in a pitiable state of destitution. Count Moltke, the artist of the expedition, was very ill, and the explorers, who were in company with several natives, inhabited an old and tattered tent. Food, but for a supply of eggs, was very low, and they had only one gun. They had abandoned their boat and all but one of their sledges at the northern part of Melville Bay. The captains were unable to furnish them with a boat or to convey them to Greenland. They, however, gave them wood to build a boat, some ammunition, potatoes, butter and other stores. The captain now expects that they may not have attempted to leave, as in the terrific weather that followed it is almost certain that they would have perished; and it is surmised that they elected to stay with the Eskimos. They would quickly fall in with Amundsen should his party not have come to grief. The whalemen consider it almost hopeless that they will succeed in making the Danish settlement this winter.

THE forthcoming session of the Royal Geographical Society, says the London *Times,* will begin on November 4, a week earlier than is usual. This, we understand, is due to the fact that Sir Frederick Lugard, who has promised to give the opening paper of the session, on northern Nigeria, is due to leave England early in November to resume his work in that part of the empire. The second paper, on November 10, will be by Commander R. E. Peary, who will give an account of his North Polar explorations and attempts to reach the North Pole, during the years 1898–1902. The next meeting, on November 23, will be occupied by a paper by Colonel C. C. Manifold, who will give an account of his recent explorations and survey work in western China, and expound his views on the economic development of that region. At the meeting on December 14 Colonel Sir Thomas Holdich will describe some of the results of his work among the Patagonian Andes, when carrying out the delimitation of the frontier between Chile and the Argentine Republic. The arrangements for the meetings of the society after Christmas are more or less provisional. Papers, however, may be expected by Colonel P. H. M. Massy, on his seven years' journeys in Asia Minor; by Captain Philip Maud, R.E., on the exploring expedition along the southern Abyssinian border, organized by Mr. Butter, who obtained Captain Maud's services as surveyor. It is possible also that Sir William Garstin may be able, before the conclusion of the session, to give the society an account of the results of his recent investigation of the Nile basin. A popular exposition of the views at present entertained with regard to the Gulf Stream may be expected from Mr. H. N. Dickson, while Mr. Keith Lucas may deal with his recent investigations among the lakes of New Zealand. It is hoped that Lieutenant Ernest Shackleton may be able to tell, in the form of a Christmas lecture to young people, of some of his adventures in the Antarctic regions,

with many lantern illustrations. It is hardly to be expected that the *Discovery* will reach home in time to enable Captain Scott to give an account of the work of the expedition. This is more likely to be the leading event of the following session.

A Reuter telegram from Vienna says: As a result of a long conflict between the Anti-Semitic members of the Landtag and Count Kielmansegg, governor of Lower Austria, on the one hand, and the general body of Vienna physicians and university professors on the other, the members of the Vienna Medical Chamber, which is entrusted with the professional control of the doctors in this city, resigned *en masse*. The conflict began ostensibly over the question of vivisection, several members of the Landtag accusing the doctors of performing experiments on animals in a manner contrary to the provisions of the Vivisection Law. The doctors allege that the whole agitation is fostered by the Anti-Semites, who are generally hostile to science, and that the fact that large proportion of Vienna doctors are Jews tended greatly to increase the hostility of the Anti-Semites.

The Bureau of Agriculture of the Philippines is organized with the following officers: F. Lamson-Scribner, Chief of Bureau; Seth Bohmanson, Chief Clerk; Harry H. Dell, Director of Animal Industry; A. P. Hayne, Director, Agricultural College and Experiment Station, Negros Occidental; A. J. Washburne, Manager of Stock Farm; Geo. M. Havice, Superintendent of Government Farm at San Raman, Mindanao; Wm. S. Lyon, in charge of Seed and Plant Introduction; Harry T. Edwards, Fiber Expert; Thomas Hanley, Expert in Tropical Agriculture; Wilfred J. Boudreau, in charge of Rice Investigations; James H. Shipley, Expert in Plant Culture; Zalmon K. Miller, Expert in Farm Management and Machinery; Thomas L. Richmond, Superintendent of Experiment Station in Manila.

UNIVERSITY AND EDUCATIONAL NEWS.

The president and fellows of Harvard University have voted to fix the number of Austin Teaching Fellowships at twenty-four. These fellowships are not subject to application like other fellowships and scholarships, but are treated like assistantships and annual instructorships as regards the manner of appointment. Of the twenty-four fellowships, twenty are under the faculty of arts and sciences, and four under the faculty of medicine.

The special course in agriculture, which has been given at the Scientific School of Yale University for twenty-five years, has been discontinued on account of the retirement of Professor Brewer.

The Prussian Ministry of Public Instruction is preparing a work on German education for the St. Louis Exposition. The book is to contain a complete account of German instruction in all its branches at the present time, and also an account of its historical development. There will be over a hundred contributors, the introduction being written by Professor Paulsen.

The University of Edinburgh has received a gift by Dr. Henry Barnes, Carlisle, of MS. letters of Boerhaave.

Messrs. W. R. Ransom and E. C. Froelich have been appointed instructors in mathematics in Harvard University.

Paul B. Bird has been appointed instructor in marine engineering at Cornell University.

Leo R. A. Suppan, Ph.G., formerly of the Rolla School of Mines in Missouri, has been elected instructor in chemistry in the St. Louis College of Pharmacy. He thus becomes associated with the recently elected professor of chemistry, Dr. Charles E. Caspari.

Mr. W. E. Williams, B.Sc., of the University College of North Wales, has been elected fellow of the University of Wales for 1904. He proposes as his subject of investigation, to be carried on at Glasgow University, 'The Effect of Magnetization on the Electrical Properties of Nickel Steel.'

Mr. Bertram Hopkinson, M.A., of Trinity College, has been elected professor of mechanism and applied mechanics at Cambridge, in place of Professor J. A. Ewing, resigned. Mr. Hopkinson is the son of the late Mr. John Hopkinson, the engineer.